



Foreign Agricultural Service

GAIN Report

Global Agriculture Information Network

Voluntary Report - public distribution

Date: 10/24/2002

GAIN Report #GM2021

Germany

Oilseeds and Products

Biodiesel in Germany - an overview

2002

Approved by:

Karina Ramos

U.S. Embassy

Prepared by:

Sabine Lieberz

Report Highlights:

German biodiesel is mostly produced from rapeseed oil. Production capacity for biodiesel increased fivefold from 110,000 MT to 533,000 MT over the period of 1995 to 2001. By the end of 2002, capacity is forecast to reach close to 1 million MT. The German government supports biodiesel use through a generous tax break.

Includes PSD changes: No
Includes Trade Matrix: No
Unscheduled Report
Berlin [GM1], GM

Table of Contents

Executive summary	Page 2
Biodiesel definition	Page 3
Production process	Page 3
Table 1: Some auto manufacturers that have RME-approved models	Page 4
Biodiesel quality	Page 4
Competitiveness	Page 5
Consumer prices	Page 6
Table 2: Consumer prices for biodiesel and fossil diesel in the Berlin area	Page 6
Production Capacity	Page 6
Table 3: Production capacity for rapeseed biodiesel in Germany	Page 6
Consumption	Page 7
Table 4: Development of biodiesel stations and sales in Germany	Page 7
Marketing	Page 7
Policy	Page 8
Table 5: EU biofuels goals and what they mean for Germany	Page 8
Outlook	Page 9
Table 6: Development of set-aside area and production of renewable resources on set-aside area	Page 9
Table 7: Development of rapeseed area and yields in Germany	Page 10
Useful links	Page 11

Executive summary

In Germany biodiesel is mostly produced from rapeseed oil. Although biodiesel from other sources exists, German car manufacturers have approved their cars only for the use of biodiesel on rapeseed basis (rapeseed methyl-esters, RME). German production capacity has increased fivefold from 110,000 MT to 533,000 MT over the period of 1995 to 2001. By the end of 2002, capacity is forecast to reach close to 1 million MT. Data about actual production is not available. The German government supports the use of biodiesel by offering a 100 percent mineral oil tax break. As a result, manufacturers prefer to produce pure RME over RME/fossil fuel blends. For the consumer, RME is currently about 3 to 10 Eurocents per liter cheaper than fossil diesel.

Rapeseed for RME production is traditionally grown on "set-aside" land. As output of rapeseed from set-aside land is restricted through the Blair House Agreement (BHA), the increasing demand has led to more and more use of rapeseed from "food area" for technical purposes. Production of rapeseed on "food area" is also limited through the BHA. Without the BHA, production could be increased to a maximum of 1.5 million hectares (ha). Further increases are not advisable for phytosanitary reasons. Currently rapeseed is grown on about 1.3 million ha (food and non-food area).

In November 2001 the EU came out with a proposal to promote the use of biofuels such as biodiesel, bioethanol or hydrogen fuels. The goal is to increase biofuel use from 2 percent in 2005 to 5.75 percent in 2010. In order to meet this goal with biodiesel alone, Germany would need 1.2 million MT of biodiesel in 2005 and 3.4 million MT of biodiesel in 2010. In order to produce that much biodiesel from locally grown rapeseed oil, Germany would in 2005 need to plant 936,000 ha of rapeseed just for this purpose and 2.57 million ha in 2010. This does not include rapeseed production area intended for food use. Even in the unlikely event that all rapeseed went into biodiesel production, Germany would only be able to meet the goals in 2005 and 2006.

U.S. trade could benefit from the growth in German biofuel usage if German producers would agree to include soybean oil in the production of biodiesel fuel. As it is, German producers will either need to import rapeseed or substitute soybean oil or other ingredients for rapeseed oil since Germany does not have the domestic capacity to meet the 5.75 usage percentage.

Biodiesel definition

Biodiesel is the colloquial name for "fatty acid methyl ester" (FAME). It refers to the fact that FAME is made from a renewable resource such as rapeseed oil, soybean oil or recycled cooking oil and has similar properties as fossil diesel fuel. In Germany, biodiesel, which is made from rapeseed oil is also called rapeseed methyl ester (RME).

Production process

Biodiesel is produced from an oil component and methanol. In Germany the oil component mostly consists of rapeseed oil. Soybean oil and recycled cooking oil is used to a much smaller extent.

Chemically speaking, oils and fats are glycerine molecules combined with three fatty acid molecules, the latter of which vary depending on the oil/fat. To produce FAME, oil and methanol are heated and in the presence of a catalyst, methanol and glycerin change their places. The result is three fatty-acid-methyl-ester-molecules plus one free glycerine molecule. After purification, glycerine can be used by the chemical or pharmaceutical industry. The process is called "transesterification":

1 molecule oil + methanol (+ catalyst) = 3 molecules FAME + glycerin + water (+ catalyst)

As a fuel FAME has the following advantages over fossil diesel:

- better lubrication quality
- no sulphur emissions (which means less acid rain)
- high oxygen content (11 percent) which ensures good burning
- high flammation point, thus no classification as a hazardous substance
- FAME is bio-degradable (less danger of soil and water contamination)

Advantages of FAME over pure vegetable oil include:

- better viscosity than pure oil
- can be used in diesel motors, while pure oil needs special motors
- fewer variation in quality
- can be mixed with fossil diesel, i.e. allowing the user to switch between the two.

Restrictions:

Biodiesel has similar properties as a solvent agent and attacks some rubber and plastic materials. It is therefore recommended to use biodiesel only in cars that have been approved for biodiesel use by their manufacturers.

Some auto manufacturers in Germany restrict their approval of biodiesel to fuels which are made up entirely of RME, some of the FAME properties vary depending on the kind of oil used to produce the fuel. German car manufacturers use only RME for their approval tests and motor development research, because when biodiesel was first developed in Germany about 20 years ago it was only made from rapeseed oil. The higher the contents of unsaturated fats in the biodiesel, the greater the

probabilities of problems with injectors, durability and winter flowability. By restricting approval to RME, car manufacturers want to prevent liability questions. Therefore working with the car industry to run additional tests with soybean oil seems to be the most promising option to increase the use of soybean oil for biodiesel production in Germany.

Table 1: Some auto manufacturers that have RME-approved models

Cars	Trucks
Audi, BMW, Mercedes, Seat, Skoda, Volvo, VW	DAF, Eberspaecher, IVECO, MAN, Mercedes, Scania, Thermo King, Volvo, Webasto

To check for specific models please visit:

for cars: <http://www.biodiesel.de/pkw.php3>

for trucks: <http://www.biodiesel.de/lkw.php3>

Biodiesel quality

A German draft standard for biodiesel (E DIN 51606) was published in June 1994 but it was never formally adopted because efforts were soon concentrated on the development of a European standard. Nevertheless this German draft standard is widely used throughout Germany and will continue to be used until the EU standard is formally adopted.

For details on the German draft standard please refer to :

<http://www.agqm-biodiesel.de/> use link "E DIN 51606" (German language only)

Work on the EU standard has progressed quite far. In September 2001 the European draft standard for biodiesel was published under the number DIN EN 14214. Publication of the final version is expected to take place before the end of CY 2002.

This standard is open to all biodiesel irrespective of the raw material used. However, it should be noted that certain features, such as iodine content, can be met more easily by RME than by other FAME. It was mainly the European auto industry, that pushed for these features.

In Germany public filling stations only offer biodiesel on a rapeseed basis, but trucking companies with their own filling stations additionally use biodiesel made from recycled cooking oils and soybean oil.

The German law governing fuel quality and quality controls (*10. BImSch*) does not cover biodiesel. Singular incidences of fuel stations providing poor quality biodiesel and resulting problems with cars were publicized by the *ADAC Motorwelt*, the magazine of the German equivalent to the AAA. Fear that these incidences might result in a lack of consumer trust in the product led to the foundation of the "working group on quality management biodiesel" (*Arbeitsgemeinschaft Qualitätsmanagement Biodiesel*)

e.V., AGQM) by the leading German biodiesel producers and traders in December of 1999. AGQM developed a monitoring and traceability system to ensure the constant good quality of the fuel its members produce and sell. A special seal for filling stations shows the consumer where they can buy quality-ensured biodiesel.

Competitiveness

The relative competitiveness of biodiesel compared to fossil diesel largely depends on fuel prices, which in turn depends on the price of crude oil, and the level of mineral oil taxes or tax exemption schemes, respectively.

Production cost for RME currently amounts to 500 to 565 Euro per 1000 l, that is more than twice the production costs for fossil diesel, which is 200 to 250 Euro per 1000 l¹. It is easy to see that RME is not competitive without government support.

The EU Commission calculates the production costs of FAME to be competitive at crude oil prices of 70 Euro per barrel or higher.

In Germany fuels are subject to the following taxes: mineral fuel tax (Mineralölsteuer), ecological tax (Ökosteuern), and a value added tax (Mehrwertsteuer, MwSt.). For diesel fuel, the mineral oil tax and ecological tax together amount to 43.97 Euro cents per liter in CY 2002 and to 47.04 Euro cents per liter from CY 2003 and onwards. Reduced rates apply for public transport, production purposes and agriculture. Both taxes are charged to the fuel producer and handed down to the consumer through a more expensive price. Taxes are not harmonized in the EU. For comparison, the lowest mineral oil tax is applied in Luxembourg with 253 Euro per 1000 liters, the highest tax is charged in the UK with 742 Euro per 1000 liters. In addition a value added tax of 16 percent is also charged at the consumer level.

Pure biodiesel is traditionally exempt from the mineral oil tax (not from the value added tax) in order to support the use of environment-friendly energy. In June 2002 the German government passed a law to prolong the tax relief until December 31, 2008 and to extend it to all other biofuels, such as bioethanol, as well as to blends. In the case of blends, only the biofuel portion is exempt from tax action. For example: a blend that contains 20 percent biofuel receives a tax reduction of 20 percent. The law will become effective in January 2003, provided the EU grants approval according to the directive 92/81/EWG.

¹Based on: rapeseed oil prices of 500 to 540 Euro per MT, processing costs vary between 68 Euro per MT for annex plants and 102 Euro per MT for singular plants, 1 MT biodiesel equals 1,136 liter, crude oil price \$ 25 per barrel.

Consumer prices

On July 23, 2002 FAS/Berlin carried out a price survey at seven gas stations in the Berlin area that stock biodiesel and fossil diesel. Prices for biodiesel varied from 69.9 Eurocents per liter to 79 Eurocents per liter, prices for fossil diesel ranged from 76.9 Eurocents per liter to 85 Eurocents per liter. The average price difference between the two diesels at any single station was 7 Eurocents per liter, varying from 3 Eurocents to 10 Eurocents depending on the station.

Table 2: Consumer prices for biodiesel and fossil diesel in the Berlin area
(numbers in Eurocents/liter)

	lowest	highest	average
biodiesel	69.9	79	73.3
fossil diesel	76.9	85	80.3
price difference at station	3	10	7

Source: Price survey at seven gas stations on July 23, 2002 conducted by FAS/Berlin

Should biodiesel be subject to the mineral tax then prices would have increased by 44 Eurocents a liter. It can easily be seen, that at the current fossil diesel price level the addition of mineral oil taxes to biodiesel would curtail its competitiveness.

Production Capacity

Production capacity for rapeseed biodiesel has increased dramatically in Germany over the past years. From 1995 to 2001 capacity has increased fivefold from 110,000 MT to 533,000 MT. By the end of 2002 capacity is forecast to reach close to 1 million MT. This development was induced by price increases for fossil diesel over the past years. In future, capacity is expected to increase further but at a lower rate than in the previous years as RME sales increases have not maintained the same speed.

Table 3: Production capacity for rapeseed biodiesel in Germany

year	production capacity in MT
1995	110,000
1996	287,000
1997	291,000
2000	346,000
2001	533,000
July 2002	676,000
factories under construction	270,000
Forecast for January 2003	946,000

Source: UFOP, FAS/Berlin calculations

Consumption

The number of cars registered in Germany, which are approved to run on biodiesel, amount to more than 2.5 million. The vast majority of biodiesel is produced from rapeseed oil. Because of the tax incentive these are sold as 100 percent RME as opposed to RME/fossil diesel blend, which are more popular in France.

The number of gas stations that sell biodiesel has increased over the past several years. Today biodiesel can be purchased at more than 1,400 out of the 17,000 gas stations throughout Germany. The statistical average distance to the next biodiesel station at any given point in Germany is about 30 km (about 19 miles). However in reality these stations are not evenly placed throughout Germany. There are more stations located in the South and West of the country. With the greater availability and accessibility of biodiesel, sales have increased ten times from 1995 to 2001.

Table 4: Development of biodiesel stations and sales in Germany

Year	Number of biodiesel stations	Sales in MT
1991		200
1992		5,000
1993		10,000
1994	251	25,000
1995	314	45,000
1996	424	60,000
1997	725	100,000
1998	800	100,000
1999	820	130,000
2000	969	340,000
2001	1,300	450,000
2002	1,400	550,000*
		*projected

Source: UFOP

Marketing

The German government supports the use of biodiesel through a tax exemption (see section on competitiveness).

Most of the public relations work is done by an association called UFOP "union for the promotion of oil and protein plants" (*Union zur Foerderung von Oel- und Eiweisspflanzen, UFOP*). UFOP was founded in 1990 and is financed through membership fees and a checkoff at sales of rapeseed,

sunflowers and pulses. Members include oil mills, large agricultural lobby groups, and seed firms, such as Monsanto Germany.

UFOP does extensive press work to increase consumer awareness of the advantages of oil and protein plant products including biodiesel. For more information check : www.ufop.de

Policy

In November 2001 the EU Commission proposed an action plan to promote the use of biofuels (COM(2001)547 published November 7, 2001) . The proposal is motivated by environmental concerns and is intended to help the EU reach the Kyoto goal of reducing CO₂ emissions. The plan intends to replace at least 2 percent of fossil fuels as of 2005 with biofuels, such as biodiesel, bioethanol, biomethanol, and biooils. The minimum percentage will then be increased in annual steps of 0.75 percent until reaching 5.75 percent in 2010. By 2020, 20 percent of fossil fuel used by automobiles shall be replaced by biofuels.

Member states are free to determine whether they want to comply with the goals by using pure biofuels or blends. The original document foresaw maximum tax reductions up to only 50 percent, which was strongly opposed by Germany, which wanted to maintain its 100 percent tax break. Meanwhile discussion has moved forward to allow member states to determine the extent of the tax exemption they want to apply in their country. Both, the EU council and the EU parliament have to agree to the proposed directive, which makes it highly unlikely that a decision will be reached in 2002.

The following table summarizes what the proposal means for Germany if it is put into effect without changes. The figures show that it will be difficult for Germany to meet the goals with biodiesel made only from locally grown rapeseed. Even if all rapeseed grown in Germany went into biodiesel production and none into food, already in CY 2007 it would not suffice to meet the EU biofuel goals.

Table 5: EU biofuels goals and what they mean for Germany

Year	expected fossil fuel consumption in 1,000 MT	pct biofuel	Amount of fossil fuel to be replaced in 1,000 MT	Amount of biodiesel needed to reach goal in 1,000 MT	Area needed to produce oil (in 1,000 ha)
2005	56,600	2.00	1,132	1,245	936
2006	56,600	2.75	1,557	1,712	1,287
2007	56,000	3.50	1,960	2,156	1,621
2008	55,300	4.25	2,350	2,585	1,944
2009	54,700	5.00	2,735	3,009	2,262
2010	54,000	5.75	3,105	3,416	2,568

Note: Decreasing fuel consumption after 2007 reflects the assumption that engines will be more energy efficient than today.
Source: Calculations based on data from "Mineralölverband, Prognose des Mineralölverbrauchs in Deutschland bis 2020, May

2002", ZMP Bilanz Getreide, Oelsaaten, Futtermittel p. 106+111, COM(2001)547. In order to produce 1 MT of biodiesel 1MT of rapeseed oil is needed. 1MT of rapeseed contains about 0.38 to 0.42 MT of rapeseed oil. The average yield in the past five years was 3.41 MT rapeseed per hectare, with an assumed average oil content of 39 percent that leads to a calculated yield of 1.33 MT rapeseed oil per hectare.

Outlook

Production

Originally rapeseed for biodiesel production was only grown on set-aside land, which was created by the EU in order to limit grain and oilseed oversupplies in the food sector. For details about the rules on set-aside land please refer to EU regulations 1251/1999 and 2316/1999.

During CY 2001, 818,533 ha were set aside in Germany under the obligatory 10 percent rule and an additional 308,732 ha were set aside voluntarily which resulted in a total set-aside area of 1.13 million ha. Allowed uses for set-aside area include fallow and production of crops for technical or non-food uses.

Oilseed production for technical use on set-aside land, however, is restricted through the Blair House Agreement (BHA) of 1992. The BHA is a memorandum of understanding between the, United States and the EU that was agreed upon under the Uruguay Round and resolved a U.S./EU dispute over EU domestic support programs. The BHA restricts the maximum EU oilseeds area for food use to the current level of 4.9338 million hectares. It also limits the annual output of side products (oil meals) from oilseeds (rapeseed, sunflowerseed and soybeans) planted on set-aside land for industrial purposes to 1 million MT annually of soybean meal equivalent.

Production on set-aside area is done on a contract basis and has to be notified to the national control authority, in Germany that is the Bundesanstalt fuer Landwirtschaft in Frankfurt (BLE). Oilseed meals resulting from production exceeding the limit must be plowed under or burned. Either way, the producer has to prove to the BLE that the meal was not used in feed or food. This requires additional administration and substantially reduces monetary returns. Therefore, producers make a special effort to remain within the production limits.

Table 6: Development of set-aside area and production of renewable resources on set-aside area

	Set-aside area			production of renewable resources			
	obligatory	voluntary	total	total	thereof rapeseed		equals rapeseed oil*
Year	ha	ha	ha	ha	ha	MT	MT
1999	833,542	341,883	1,175,425	369,453	336,211	1,055,552	411,665
2000	823,065	308,470	1,131,535	340,679	332,350	930,228	362,789
2001	818,533	308,732	1,127,265	331,490	306,710	966,592	376,971
2002				354,243	328,513	961,200	374,868

* based on an oil contents of 39 percent

Source: ZMP Bilanz Getreide, Oelsaaten, Futtermittel 2001 and 2002; BLE, Frankfurt; FAS/Berlin calculations

Prices for rapeseed from set-aside land are usually about 5 to 10 Eurocent below food rapeseed. The price difference is not because of a smaller market for this rapeseed, but to account for the higher administrative costs for trader and processor, who have to report trade and output volumes to the BLE in Frankfurt to ensure compliance with the BHA.

Aside from biodiesel, rapeseed oil is currently being used for other non-food purposes including lubricants and detergents. But even if all rapeseed oil from set-aside land was to be used for biodiesel production, it would not suffice to meet the demand by the biodiesel processors. As a consequence, a growing share of food rapeseed oil is used for the production of biodiesel.

However, due to the acreage restrictions in the BHA, food rapeseed area may not be increased without limit. The German "adjusted maximum guaranteed area" (MGA) currently amounts to 836,100 ha. Only as long as the EU in total does not exceed its MGA, individual countries may grow more than their national MGA without risking penalties. The last time the EU overshot its MGA was in MY 1999/2000. With the reform of the CAP (AGENDA 2000) the EU has reduced its oilseeds payments to the same level as for grains. In the mind of the EU these reforms have rendered the BHA obsolete. This opinion is not shared by the United States .

Table 7: Development of rapeseed area and yields in Germany

	"food" area		"non-food" area		total area	
	ha	MT	ha	MT	ha	MT
1998	876	3,025	131	363	1,007	3,388
1999	862	3,229	336	1,056	1,198	4,285
2000	746	2,655	332	930	1,078	3,586
2001	831	3,194	307	967	1,138	4,160
2002	968		329		1,297	3,886

Even without the BHA restrictions, rapeseed production capacity in Germany is limited. For phytosanitary reasons, rapeseed should only be grown once every four years on the same area. In 2001 Germany's arable land area amounted to 11.8 million ha. A fourth of which would be roughly 3 million ha. However, rapeseed production is not competitive on all of that land. Realistically total German rapeseed area faces its natural limits at about 1.5 million ha., which would only leave space for a further increase of about 200,000 ha over the current area of 1.3 million ha (food and non-food).

On the other hand, there is a growing demand for food rapeseed oil, as food processing companies reformulate their products in order to evade the GMO discussion connected with soybean products. This could result in higher imports of rapeseed oil (for food and/or non-food purposes) or higher prices for rapeseed oil or both. Higher prices for rapeseed oil would endanger price competitiveness of biodiesel versus fossil diesel which could curtail biodiesel production.

In order to met the requirements laid down in the EU proposal (see above), Germany has the following options:

- increase imports of rapeseed (in MY 2001/2002 imports were at 1,27 million MT)

- decrease exports of rapeseed (in MY 2001/2002 exports were at 649,700 MT)
- increase imports of rapeseed oil (in MY 2001/2002 imports were at 106,000 MT)
- decrease export of rapeseed oil (in MY 2001/2002 exports were at 910,000 MT)
- use soybean oil for biodiesel production
- develop other biofuel sources, e.g. bioethanol.

Possible effects on U.S. trade

The German demand for rapeseed oil for industrial purposes as well as for food use is expected to increase, as biodiesel production capacity is forecast to almost double by 2003, and for food purposes rapeseed oil is used to avoid GMO concerns. In order to meet the increasing demand Germany has to increase its rapeseed/rapeseed oil imports and /or decrease its rapeseed/rapeseed oil exports, which will leave a gap in the countries of origin/destination. This gap could be filled by U.S. soybeans/soybean oil.

The top five countries of German rapeseed trade in MY 2001/2002 :

German exports by destination:

rapeseed: Great Britain, Denmark, Sweden, Bangladesh, Belgium

rapeseed oil: Netherlands, France, Italy, Algeria, Belgium

German imports by origin:

rapeseed: France, Czech Republic, Slovakia, Hungary, Great Britain

rapeseed oil: Netherlands, Denmark, Great Britain, France, Belgium

The development of other biofuel sources would not benefit U.S. trade as those products would most likely be made from locally grown raw materials such as sugar beets or rye.

Useful links

EU action plan to promote the use of biofuels:

http://www.europa.eu.int/eur-lex/en/com/pdf/2001/en_501PC0547_01.pdf

Database to check for vehicles that are approved for RME use

for cars: <http://www.biodiesel.de/pkw.php3>

for trucks: <http://www.biodiesel.de/lkw.php3>

Union for the Promotion of Oil and Protein Plants (UFOP): www.ufop.de

German draft standard for biodiesel:

<http://www.agqm-biodiesel.de/> use link "E DIN 51606" (German language only)